UNITED STATES DEPARTMENT OF AGRICULTURE

FARM SERVICE AGENCY

FINAL

Programmatic Environmental Assessment for Implementation of the Conservation Reserve Enhancement Program Agreement for the Illinois River Watershed in Arkansas

August 2007

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COVER SHEET

Proposed Action: The U.S. Department of Agriculture (USDA) Farm Service Agency (FSA) proposes to implement the Conservation Reserve Enhancement Program (CREP) agreement for the Illinois River Watershed in Arkansas. CREP is a voluntary land conservation program for agricultural landowners.

Type of Statement: This programmatic environmental assessment (PEA) was prepared in accordance with the *National Environmental Policy Act* (42 *United States Code* parts 4321 et seq., 2000), the Council on Environmental Quality implementing regulations (40 *Code of Federal Regulations* parts 1500 et seq., 2006), and *Environmental Quality and Related Environmental Concern—Compliance with the National Environmental Policy Act* (7 *Code of Federal Regulations* parts 799 et seq., 2007). This analysis is programmatic in nature and does not address individual site specific impacts, which would be evaluated for individual CREP contracts prior to approval.

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EXECUTIVE SUMMARY

This programmatic environmental assessment identifies the possible environmental consequences resulting from the proposed implementation of the Conservation Reserve Enhancement Program agreement for the Illinois River Watershed in Arkansas. The assessment process is designed to inform decision makers and the public about the potential environmental effects of the proposed action and to ensure public involvement in the process. The process will help decision makers take into account all environmental factors when making decisions related to the proposed action.

This programmatic environmental assessment has been prepared by the U.S. Department of Agriculture Farm Service Agency in accordance with the requirements of the *National Environmental Policy Act* (42 *United States Code* parts 4321 et seq., 2000), the Council on Environmental Quality implementing regulations (40 *Code of Federal Regulations* parts 1500 et seq., 2006), and *Environmental Quality and Related Environmental Concern—Compliance with the National Environmental Policy Act* (7 *Code of Federal Regulations* parts 799 et seq., 2007).

Purpose and Need for the Proposed Action

The purpose of this action is to implement the Conservation Reserve Enhancement Program agreement for the Illinois River Watershed in Arkansas to reduce the amounts of pathogens, sediments, and phosphorus entering waterways. Under this agreement, eligible agricultural land would be removed from production and planted in grass, shrubs, and trees.

The proposed action is needed to:

- Improve overall water quality in the Illinois River Watershed
- Decrease road maintenance
- Preserve existing floodplain pasture
- Enhance wildlife habitat
- Promote soil and water conservation.

Proposed Action and No Action Alternatives

This programmatic environmental assessment documents the analysis of the proposed action and no action alternatives. The proposed action would remove 15,000 acres of land from agricultural production and establish approved conservation practices on the land. Eligible land would include cropland, pastureland, and marginal pastureland adjacent to streams, rivers, or lakes within the Illinois River Watershed in Arkansas.

The proposed action would provide participants with annual rental payments at 200 percent of established pastureland rates and annual maintenance payments of $9 per acre. Participants would also receive one time payments including $200 per acre, a 50 percent cost share payment, and a $100 per acre signing incentive payment.

Under the no action alternative, lands would not be removed from agricultural production and conservation practices would not be implemented.

The Farm Service Agency has identified the proposed action as the preferred alternative because it is the alternative that would satisfy the purpose and need for the proposed action.

Summary of Environmental Consequences

It is expected that there would be both beneficial and temporary minor adverse impacts associated with implementation of the proposed action. A summary of the potential impacts is given in Table ES.1.

Table ES.1 Summary of potential impacts from implementation of the proposed action and no action alternatives.

Resource	Proposed Action	No Action
Biological Resources	• Increased quality and abundance of wildlife and fisheries habitats, including those used by protected species • Establishment of migration corridors for wildlife • Reduced habitat fragmentation • Increased vegetation diversity • Beneficial impacts to five of six protected species; no or negligible impact to remaining species with appropriate mitigation measures in place • Temporary adverse impacts due to human disturbance and increased sedimentation.	• Increased loss, degradation, and fragmentation of habitats • Decreased health and persistence of fish populations • Continued alteration and depletion of native vegetation.
Cultural Resources	• Potential for encountering both recorded and unidentified archeological and architectural sites and traditional cultural properties • Actions to be reviewed with the Arkansas State Historic Preservation Office on a site specific basis • No anticipated impact to cultural resources.	• Continuation of farming not expected to impact resource • Potential adverse impacts if agricultural practices occur on previously undisturbed lands.
Water Resources	• Reduced pathogens, sediments, phosphorus, and other pollutants in surface water, groundwater, and wetlands • Greater rates of aquifer recharge • Improved function of floodplains • Beneficial impacts to surface water, groundwater, wetlands, and floodplains.	• Continued degradation of surface water, groundwater, and wetlands due to pathogens, sediments, phosphorus, and other pollutants • Continuation of current rates of erosion and changes in topography of floodplains.
Soil Resources	• Stabilization of soils and topography • Reduced wind and water erosion • Temporary increase in erosion during implementation.	• Continuation of current rates of erosion and changes in topography due to erosion.
Air	• Increased vegetation would reduce erosion • Vegetation may help reduce dust and bacteria emissions from confined animal operations • Decreased acreage in agricultural production would reduce field burning and tilling	• No change to existing conditions.

Table ES.1 Continued

Resource	Proposed Action	No Action
	• Beneficial impacts to local air quality • Temporary, minor adverse impacts during implementation activities.	
Recreation	• Benefits to recreation from improved water quality, wildlife habitat, and aesthetics • Temporary displacement of wildlife species and increased sediments in waterways during implementation.	• No change to existing conditions.
Traffic and Transportation	• Reduced erosion and sedimentation may reduce highway and road system maintenance expenditures.	• No change to existing conditions.
Socio-economics	• Positive net present value for program • Implementation would create total net present value of $3.4 million over 15 years • Increased recreation opportunities may generate economic activity.	• Socioeconomic conditions would continue to follow current trends.
Environmental Justice	• No change to existing conditions.	• No change to existing conditions.

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ACRONYMS AND ABBREVIATIONS

ADEQ	Arkansas Department of Environmental Quality
AHPP	Arkansas Historic Preservation Program
AMAWPT	Arkansas Multi-Agency Wetland Planning Team
ANHC	Arkansas Natural Heritage Commission
ANRC	Arkansas Natural Resources Commission
ASHPO	Arkansas State Historic Preservation Office
BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
BMP	best management practice
CCC	Commodity Credit Corporation
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
CP	conservation practice
CPGL	Conservation of Private Grazing Lands
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
DDT	dichloro-diphenyl-trichloroethane
EO	Executive Order
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
FEMA	Federal Emergency Management Agency
FR	*Federal Register*
FS	Forest Service
FSA	Farm Service Agency
FWS	Fish and Wildlife Service

FY	fiscal year
GRP	Grassland Reserve Program
HIP	Harvest Information Program
LMBV	largemouth bass virus
NAAQS	National Ambient Air Quality Standards
NEPA	*National Environmental Policy Act*
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSFHWAR	*National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*
NWR	national wildlife refuge
PEA	programmatic environmental assessment
ROI	region of influence
SIP	signing incentive payment
TCP	traditional cultural property
TMDL	total maximum daily load
USACE	U.S. Army Corps of Engineers
USC	*United States Code*
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WHIP	Wildlife Habitat Incentives Program
WMA	wildlife management areas
WRP	Wetlands Reserve Program

1.0 INTRODUCTION

The U.S. Department of Agriculture (USDA) Farm Service Agency (FSA) proposes to implement the draft Conservation Reserve Enhancement Program (CREP) agreement for the Illinois River Watershed in Arkansas (hereafter referred to as the *Illinois River Watershed CREP agreement*) (Appendix A). This programmatic environmental assessment (PEA) has been prepared to analyze the potential environmental consequences associated with the proposed action and the no action alternatives in accordance with the *National Environmental Policy Act* (NEPA) (42 *United States Code* [USC] parts 4321 et seq., 2000), the Council on Environmental Quality (CEQ) implementing regulations (40 *Code of Federal Regulations* [CFR] parts 1500 et seq., 2006), and *Environmental Quality and Related Environmental Concern—Compliance with the National Environmental Policy Act* (7 CFR parts 799 et seq., 2007). This analysis is programmatic in nature and does not address individual site specific impacts, which would be evaluated for individual CREP contracts prior to approval.

1.1 Background

FSA was established during the reorganization of USDA in 1994. The mission of FSA is to:

> "...ensure the well-being of American agriculture and the American public through efficient and equitable administration of agricultural commodity, farm loan, conservation, environmental, emergency assistance, and domestic and international food assistance programs." (FSA 1997)

The Conservation Reserve Program (CRP) was established under Title XII of the *Food Security Act of 1985* (16 USC part 3831, 1996). The purpose of CRP is to cost-effectively assist owners and operators in conserving and improving soil, water, and wildlife resources on their farms and ranches. Highly erodible and other environmentally sensitive acreage, normally devoted to the production of agricultural commodities, is converted to a long-term resource conservation cover. CRP participants enter into contracts for periods of 10 to 15 years in exchange for annual rental payments and cost-share assistance for installing certain conservation practices (CPs).

The *Farm Security and Rural Investment Act of 2002*, commonly known as the *2002 Farm Bill*, authorizes CRP through December 31, 2007, and raises the overall enrollment cap to 39.2 million acres (16 USC part 3831, 1996). The *Conservation Reserve Program Final Programmatic Environmental Impact Statement* contains a detailed analysis of the impacts of implementing CRP nationwide, including the CREP component (FSA 2003a).

The Secretary of Agriculture initiated CREP in 1997. CREP is authorized pursuant to the *Federal Agriculture Improvement and Reform Act of 1996* and is a subset of CRP (7 USC parts 7201 et seq., 1998). This program is based on the continuous CRP model (i.e., producers can sign up anytime provided their operation is located within an area covered by a CREP proposal) but differs in four important ways (FSA 2006a):

- CREP is targeted to specific geographic areas and designed to focus CPs on addressing specific environmental concerns.
- CREP is a partnership between USDA, State and/or tribal governments, other Federal and State agencies, environmental groups, wildlife groups, and other stakeholders who have an interest in addressing particular environmental issues.
- CREP is results-oriented, and requires States to establish measurable objectives and conduct annual monitoring to measure progress toward implementation of those objectives.

- CREP is flexible, within existing legal constraints, and may be adapted to meet local conditions on the ground.

This voluntary program uses financial incentives to encourage farmers and ranchers to enroll in contracts of 15 years in duration to remove lands from agricultural production. The two primary objectives of CREP are to:

- Coordinate Federal and non-Federal resources to address specific conservation objectives of a State and the Nation in a cost-effective manner.
- Improve water quality, erosion control, and wildlife habitat related to agricultural use in specific geographic areas.

CRP and CREP are administered by FSA in cooperation with the Natural Resources Conservation Service (NRCS) and the Arkansas Natural Resources Commission (ANRC). FSA is the lead agency in the development of this PEA.

1.1.1 Regulatory Compliance

This PEA has been completed as part of the NEPA process and is in compliance with CEQ and FSA implementing regulations (40 CFR parts 1500 et seq., 2006; 7 CFR parts 799 et seq., 2007). The intent of NEPA is to protect, restore, and enhance the human environment through well-informed Federal decisions. The following non-exclusive list of higher-tier executive orders (EOs), acts, and relevant decision and guidance documents apply to actions undertaken by Federal agencies and form the basis of the analysis presented in this PEA (see Appendix B for summaries):

- *Clean Air Act* (42 USC parts 7401 et seq., 1999)
- *Clean Water Act* (33 USC parts 1251 et seq., 2000)
- *Endangered Species Act of 1973*, as amended (16 USC parts 1531 et seq., 1988)
- EO 11514, *Protection and Enhancement of Environmental Quality* (35 *Federal Register* [FR] 4247, 1977)
- EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 32, 1995)
- *National Historic Preservation Act of 1966*, as amended (16 USC part 470, 2000).

1.2 Purpose and Need for Action

The purpose of this action is to implement the Illinois River Watershed CREP agreement to reduce the amounts of pathogens, sediments, and phosphorus entering waterways. The primary need for this action is to improve the overall water quality in the Illinois River Watershed. This action is expected to provide the following secondary benefits:

- Decreased road maintenance
- Preservation of existing floodplain pasture
- Enhanced wildlife habitat

- Promotion of soil and water conservation.

1.3 Objectives

CREP agreements are designed to meet specific regional conservation goals and objectives related to agriculture. The proposed agreement with Arkansas is focused on improving water quality in the Illinois River Watershed. This watershed is a major poultry growing and cattle producing area, and waterways are subject to impairments related to these activities. Livestock access to floodplains contributes to the presence of pathogens and to high levels of sediment input from streambank erosion. The excessive buildup of phosphorous is due to the common practice of fertilizing the soil for grazing purposes by applying poultry litter.

The primary objective of the Illinois River Watershed CREP agreement is to reduce pathogen, sediment, and phosphorous input to the watershed. This would be accomplished by restoring riparian vegetation and reducing livestock access to floodplains. These actions would result in less overland flow of pathogens, sediments, and phosphorous to streams and less stream bank erosion. This, in turn, would result in better water quality, lower maintenance requirements to road and highway systems, and would help to preserve existing floodplain pasture.

Under the proposed CREP agreement, farmers and ranchers who voluntarily participate would enter into contracts with the Federal government for 15 years, agreeing to remove portions of their land from agricultural production and plant them to grass, shrubs, and trees. On all approved CREP contracts, landowners will be given the opportunity to enroll CREP lands in perpetual easements.

The CREP agreement would intend on enrolling 15,000 acres of riparian land in the Arkansas portion of the Illinois River Watershed. As the exact location of parcels that might be enrolled in CREP is not known at this time, this PEA considers the region of influence (ROI) to be the area bounded by roads that most closely follow the watershed boundary (Figure 1.1). This area encompasses approximately 482,732 acres and spans portions of Benton and Washington counties.

The intended outcome of the CREP agreement is to enhance the ability of producers to enroll certain acreage under CRP where deemed desirable by USDA and the Commodity Credit Corporation (CCC). CCC is a Federal entity within USDA that was created to stabilize, support, and protect agricultural income and prices.

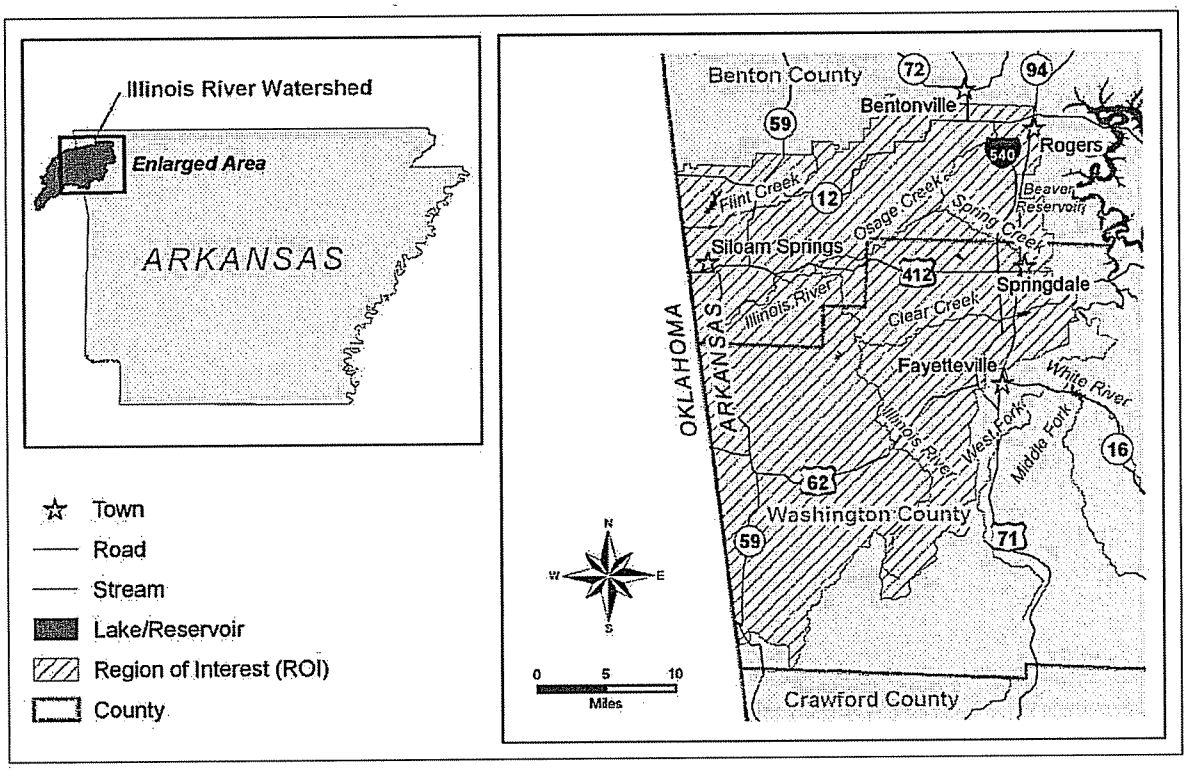

Figure 1.1 Area proposed for CREP enrollment (i.e., the ROI).

1.4 Organization of the PEA

This PEA discloses the potential impacts of the proposed action and no action alternatives on affected environmental and economic resources. Chapter 1.0 provides background information relevant to the proposed action and discusses the purpose and need for the proposed action. Chapter 2.0 describes the proposed action and no action alternatives. Chapter 3.0 describes the baseline conditions (i.e., the conditions against which potential impacts of the proposed action and no action alternatives are measured) for each of the resource areas. Chapter 4.0 explains the potential environmental impacts to these resources. Chapter 5.0 provides an analysis of cumulative impacts and irreversible resource commitments. Chapter 6.0 describes mitigations to reduce potential impacts of the proposed action. Chapter 7.0 is a list of the preparers of this document, and Chapter 8.0 lists those persons and agencies contacted during the preparation of this document. Chapter 9.0 is a glossary of terms and Chapter 10.0 contains references used in the PEA.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter describes the proposed action and no action alternatives. These two alternatives are compared in terms of their environmental impacts and ability to achieve the objectives listed in Section 1.3. FSA has identified the proposed action as the preferred alternative because it is the alternative that would satisfy the purpose and need for the proposed action.

2.1 Proposed Action (Preferred Alternative)

The preferred alternative would implement the Illinois River Watershed CREP agreement by enrolling 15,000 acres of riparian land in the Arkansas portion of the Illinois River Watershed. Specific CPs would be installed on eligible land and according to rules in *Agricultural Resource Conservation Program for State and County Offices* (*Handbook 2–CRP*) (FSA 2003b).

Eligible land would include cropland, pastureland, and marginal pastureland adjacent to streams, rivers, or lakes within the Illinois River Watershed in Arkansas. This includes portions of Benton and Washington counties. Cropland must have been planted, or considered planted, to a crop in four of the six years between 1996 and 2001. Marginal pastureland must be suitable for use as a riparian buffer planted to trees or as wildlife habitat buffer. If the land is currently enrolled in CRP, that contract must expire before being eligible for CREP.

2.1.1 Established Conservation Practices

There are two CPs proposed for implementation under the CREP agreement. These are CP22—Riparian Buffer and CP29—Marginal Pastureland Wildlife Habitat Buffer with modifications.

These CPs require a contract period of 15 years and would be installed according to *Handbook 2–CRP* provisions unless otherwise specified in the Illinois River Watershed CREP agreement. Installation and maintenance of CPs may include activities such as tilling, excavation, prescribed burning, herbicide application, and mowing. A detailed description of each CP is provided in Appendix C.

2.1.2 Financial Support to Land Owners

The preferred alternative would provide participants with annual soil rental payments for each acre enrolled at 200 percent of established county pastureland rates and annual maintenance payments of $9 per acre (Table 2.1). In addition, the State would make a one-time lump sum payment of $200 per acre and FSA would provide one time signing incentive payment (SIP) of $100 per acre and a 50 percent cost share payment (Table 2.1).

Table 2.1 Financial incentives that would be provided to participants under the preferred alternative.

County	Annual Payments			One Time Payments		
	Pasture Rental Rate per Acre	Additional Pasture Rental Rate per Acre	Maintenance Payment per Acre	Lump Sum Payment (per acre)	SIP (per Acre)	Cost Share Payment
Benton	$38	$38	$9	$200	$100	50%
Washington	$34	$34	$9	$200	$100	50%

2.2 Scoping

2.2.1 Discussion

Scoping is a process used to identify any issues that may affect environmental and social resources as a result of the proposed action, and to explore other possible ways of achieving objectives while minimizing adverse impacts. Regulatory agencies, tribal representatives, FSA specialists, and other interest groups were contacted to refine the project purpose and need, to designate resources of potential impact, and to develop preliminary alternatives. Consultations with the U.S. Fish and Wildlife Service (FWS) and the Arkansas State Historic Preservation Office (ASHPO) were completed at a programmatic level.

Public involvement commenced on February 12, 2007 with letters mailed to 36 persons, organizations, and agencies. Recipients included several American Indian tribes that historically resided in or migrated through Arkansas and are federally recognized as tribes associated with Arkansas, even though they are currently based in Oklahoma, and may have ties to cultural resources within the ROI. Three letters of response were received; two of which were favorable to the project and one that was an indifferent opinion.

A complete list of persons and agencies contacted is available in Chapter 8 of this document. These letters included a summary of the proposed action and alternatives and solicitation for comments

2.2.2 Resources Considered but Eliminated from Analysis

CEQ implementing regulations require that issues which are not significant or which have been covered by prior environmental review be identified and eliminated from detailed study (40 CFR parts 1500 et seq., 2006). Accordingly, several resources have been eliminated from further analysis in this PEA either because they do not occur within the ROI identified in Section 1.3 (sole source aquifers, coastal zones, paleontological resources, wild and scenic rivers, national natural landmarks, wilderness areas) or because they would not be impacted by the proposed action (noise, human health and safety). A brief discussion of these resources is provided in the following subsections.

Sole Source Aquifers

The U.S. Environmental Protection Agency (EPA) defines a sole source aquifer as one which supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas have no alternative drinking water source which could physically, legally, and economically supply all those who depend upon the aquifer for drinking water (EPA 2006a, b).

Coastal Zones

There are no coastal zones in or near the ROI.

Paleontological Resources

Paleontological resources (e.g., fossils) may be considered part of the national natural, scientific, and educational heritage. There is currently no unified Federal policy regarding the treatment of paleontological resources outside of an archaeological context; however, various historic, cultural, or natural resource preservation statutes may apply to fossil resources on State and Federal lands.

Noise

Implementation of the proposed action would not permanently increase ambient noise levels. Noise levels may increase slightly during installation of CPs, but this increase would be temporary and would cease after installation.

Human Health and Safety

The proposed action would not have any permanent or significant impact to human health and safety.

Wild and Scenic Rivers

Wild and scenic rivers are designated and protected under the *Wild and Scenic Rivers Act* (16 USC parts 1271–1287, 1968). These rivers must be preserved in their free-flowing conditions and, with their immediate environments, protected for the benefit of present and future generations.

National Natural Landmarks

A national natural landmark is an area designated by the Secretary of the Interior as being of national significance because it is an outstanding example of major biological and geological features found within the boundaries of the U.S. (36 CFR parts 62.1–62.9, 2006).

Wilderness

A wilderness area is federally owned land that has been designated by Congress for inclusion in the National Wilderness Preservation System (16 USC parts 1131 et seq., 1964).

2.3 Alternatives Eliminated from Analysis

No alternatives were eliminated from analysis.

2.4 Alternatives Selected for Analysis

2.4.1 Alternative A—Preferred Action

Alternative A, the preferred action, would implement the Illinois River Watershed CREP agreement by enrolling 15,000 acres of riparian land in the Arkansas portion of the Illinois River Watershed. Specific CPs would be installed on eligible land to restore riparian vegetation and restrict livestock access to floodplains. This action is intended to improve water quality by reducing the levels of pathogens, sediments, and phosphorous entering waterways. Participants would receive annual rental and maintenance payments for the 15-year contract periods, as well as one-time SIPs and cost share payments.

2.4.2 Alternative B—No Action

Alternative B, the no action alternative, would involve not implementing the Illinois River Watershed CREP agreement. No land would be enrolled in CRP, and the goals for the Illinois River Watershed CREP would not be met. This alternative would result in a continuation of current agricultural practices that have led to the degradation of water quality due to increased levels of pathogens, sediments, and phosphorous.

2.5 Comparison of Alternatives

2.5.1 Identification of Geographical Boundaries

The proposed project area (i.e., ROI) is the Arkansas portion of the Illinois River Watershed that is bounded by roads that most closely follow the watershed boundary (Figure 1.1). This encompasses an area of approximately 482,732 acres and spans portions of Benton and Washington counties. The largest town within the ROI is Springdale, which reported a total population of 45,798 in 2000 (U.S. Census Bureau [USCB] 2007).

2.5.2 Identification of Temporal Boundaries

Landowners participating in the Illinois River Watershed CREP would enroll in 15 year contracts, obligating them to implement the proposed CPs in return for technical and financial assistance. Eligible contracts would be signed by 2007, which would establish the year 2022 as the temporal boundary for the purposes of this analysis. This same temporal boundary is used for the analysis of the no action alternative. On all approved CREP contracts, landowners will be given the opportunity to enroll CREP lands in perpetual easements.

All landowners enrolling eligible land into the Illinois River CREP will be given the opportunity to place a perpetual conservation easement on enrolled acres through the easement portion of this proposed CREP. Perpetual easements are not a required component of the Illinois River CREP. This portion of the CREP will allow landowners to obtain permanent easements soon after the practice is completed and verified as successfully established.

The State of Arkansas will be designated as the "Easement Manager" and be the primary holder of the permanent conservation easements. Arkansas natural resource agencies may assist in easement boundary marking and monitoring easements during and beyond the initial 15-year CREP contract period.

3.0 AFFECTED ENVIRONMENT

This chapter describes relevant existing conditions for the resources potentially affected by the proposed action and no action alternatives. In compliance with guidelines contained in NEPA and CEQ regulations, the description of the affected environment focuses on those aspects potentially subject to impacts. Resources within the ROI are analyzed by geographic area or by county, depending on the spatial character of the available data.

3.1 Biological Resources

3.1.1 Wildlife and Fisheries

3.1.1.1 Description

Wildlife and fisheries include terrestrial, avian, and aquatic species and the habitats in which they occur. The ROI for this resource analysis is Benton and Washington counties.

3.1.1.2 Affected Environment

3.1.1.2.1 Wildlife

The Arkansas Game and Fish Commission (AGFC) has the authority to control, manage, restore, conserve, and regulate birds, fish, game, and wildlife resources within the State of Arkansas (Arkansas Constitutional Amendment 35, 1944). AGFC protects non-game species (i.e., species that are not hunted, fished, or trapped) and establishes hunting regulations and seasons for all game species (Table 3.1).

Table 3.1 Common and scientific names of game species and furbearing mammals in the ROI.

Common Name	Scientific Name	Common Name	Scientific Name
Bear, black	*Ursus americanus*	Beaver, American	*Castor canadensisis*
Bobcat	*Lynx rufus*	Coyote	*Canis latrans*
Deer, white-tailed	*Odocoileus virginianus*	Fox, grey	*Urocyon cinereoargenteus*
Fox, red	*Vulpes vulpes*	Hog, feral	*Sus scrofa*
Mink	*Mustela vison*	Muskrat	*Ondatra zibethica*
Nutria	*Myocastor coypus*	Opossum, Virginia	*Didelphis virginiana*
Otter, river	*Lutra canadensis*	Quail, bobwhite	*Colinus virginianus*
Rabbit, cottontail	*Sylvilagus floridanus*	Rabbit, swamp	*Sylvilagus aquaticus*
Raccoon	*Procyon lotor*	Skunk, spotted	*Spilogale puforius*
Skunk, striped	*Mephitis mephitis*	Squirrel, fox	*Sciurus niger*
Squirrel, gray	*Sciurus carolinensis*	Turkey, Eastern wild	*Meleagris gallopavo silvestris*
Table source: AGFC 2005a			

Big Game Species

There are four big game species that can be hunted in Arkansas: white-tailed deer, black bear, wild turkey, and elk. All of these species except elk occur within the ROI. During the 1930s, white-tailed deer were reduced to a population of roughly 500 deer in the entire State. AGFC attempted to halt the species' decline by establishing the State's first hunting season and bag limit; however, herds continued to decline and restoration efforts began. Arkansas's first Federal game refuge was created in 1926, followed by the

first State-operated refuge in 1927. White-tailed deer were brought in from other states and placed in the refuges to boost Arkansas's population. By 1950, white-tailed deer could be found in 71 of the 75 counties within the State, including Benton and Washington counties (AGFC 1999).

White-tailed deer populations within the ROI are relatively healthy as evidenced by 1.8 fawns per adult doe, a 72 percent average kidney fat index, and higher than average weights (AGFC 2004). These are all indicators of good white-tailed deer habitat and health. In the 2004–2005 hunting season, harvests yielded 728 bucks and 332 does from Benton County and 1,124 bucks and 408 does from Washington County (AGFC 2004). These data indicate a slightly above average harvest from these two counties compared to the rest of the State (AGFC 2004).

White-tailed deer habitat is comprised of open woodland areas, mixed pine and hardwood forests, brushlands, and areas of forest *edge* (i.e., where the forest meets open land) (Sutton 1998). Thick vegetation found on recently disturbed land provides excellent foraging areas where deer can browse on twigs, shoots, and leaves of new growth. They will also forage on field growing vegetation, such as various grasses and clover (Sutton 1998).

Black bears are present, although not overly common, in the ROI. Washington County reported three black bears harvested in the 2004–2005 hunting season (AGFC 2005b). There were no black bears harvested during that season within Benton County, even though they are known to occur in the area (AGFC 2005b). Black bear populations are on the rise in Arkansas due to recovery efforts made during the 1950s and 1960s, when the species was extirpated from the western portion of the State and limited throughout the remaining areas (Clark 1998).

Black bears are very diverse in their habitat requirements, which include adequate denning sites, a large supply of high quality food sources, and protective cover (Clark 1998). In areas of excellent habitat, male black bears can weigh over 400 pounds, while female black bears rarely weigh over 300 pounds (Clark 1998).

Wild turkeys can be found in every county in Arkansas including the ROI. Benton and Washington counties reported record harvests during the 2001 hunting season, with harvests of 73 and 138 turkeys, respectively (AGFC 2001a). Despite these record harvests, these numbers were significantly lower than that of surrounding counties (AGFC 2001a).

Market hunting, poor logging and agricultural practices, livestock grazing, and year round hunting in the early 1900s caused populations of Eastern wild turkey in Arkansas to decline significantly (AGFC 2001b). In 1915, soon after AGFC was established and market hunting became illegal, a hunting season and bag limit was set for wild turkeys to stop further decline of the State's populations. Hunting restrictions protected hens year round in an attempt to increase population size. Subsequent years brought shorter seasons, smaller bag limits, and entirely closed seasons (AGFC 2001b). From 1920 to 1940, pen raised turkeys were released throughout the State, but without much success (AGFC 2001b). Restoration efforts were more successful once AGFC began using cannon netting to capture turkeys to move them to repopulate other areas within the State. This proved much more effective than supplementing populations with hatchery-reared birds.

Eastern wild turkeys require diverse forest habitat types for survival. Prime habitat is a blend of mixed hardwoods, conifers, areas of open understories, well-distributed water sources, and some cropland.

Small Game Species

Small game in Arkansas includes furbearers, quail, rabbit, squirrel, feral hogs, and migratory game birds. Furbearers are opossum, beaver, otters, muskrat, nutria, coyote, fox, raccoon, mink, skunk, bobcat,

badger, and weasel. Badger and long-tailed weasel populations are very low in Arkansas, and they probably do not occur in the ROI in significant numbers.

In Arkansas, the Virginia opossum has accounted for 36 percent of all furbearing species harvested since 1942 (AGFC 2001c). Opossum pelts are presently of low economic value so, even though the species is common throughout the State, it is not a sought after species.

Beaver were almost eliminated from Arkansas by the 1900s due to unregulated trapping and hunting. The beginning of restocking efforts in 1926 allowed hunters to take two beaver per season in subsequent years. In 1970, AGFC declared beavers unprotected because populations had risen, causing the beaver in some areas of the State to be classified as a nuisance species (AGFC 2001c). Though population numbers have since been regulated, beaver populations are still on the rise in Arkansas and the ROI.

Beavers create habitat for river otters, so population fluctuations of each species are often similar. As with other species, river otters were over-harvested in the 1900s, causing population levels to drop. They were afforded more habitat once beaver populations became more stable, and AGFC listed the river otter as a legal furbearer for harvest in 1961 (AGFC 2001c). Though river otters are more common in the southern and eastern portions of the State, the species does occupy river drainages in the region encompassing the ROI.

Arkansas land uses, such as rice and fish farming, create excellent muskrat habitat due to the irrigation practices that accompany these exploits. This, along with the low economic value of muskrat pelts, has led to unacceptably high populations of Arkansas muskrats in the past (AGFC 2001c). Landowners can take muskrats out of trapping season if they are damaging irrigation structures, but few complaints of this have been recorded. Nineteen percent of muskrats harvested in the 2001 furbearing season came from the Ozark Mountain region, which is located in the northwestern portion of the State and encompasses the ROI (AGFC 2001c).

Nutria were first introduced in Louisiana to control aquatic vegetation and, since then, this species has expanded their range into Oklahoma, Arkansas, Mississippi, Tennessee, and Alabama (AGFC 2001c). Nutria have limited natural predators and measures taken to control the species have been ineffective. Trapping seasons for nutria have been extended due to the species becoming a nuisance. Though nutria may occur within the ROI, the highest population densities occur more in the western and eastern portions of the State (AGFC 2001c).

Coyote are present in every county in Arkansas (AGFC 2001c). Coyotes are beneficial to the State because they prey on small rodent populations. However, coyotes also prey on poultry, game birds, and some domestic pets, and have been known to hybridize with domestic dogs. Results of the 2001 furbearing harvest indicate that the population of coyotes in and around the ROI may be higher than that of the rest of the State (AGFC 2001c).

The two species of fox that may be harvested in Arkansas are the red fox and the grey fox (AGFC 2005a). Historically, red fox populations in throughout Arkansas have fluctuated greatly, causing the species to be protected on and off since 1940. Populations remained small while most of the State was forested, but increased as agricultural practices opened up landscapes (AGFC 2001c). Coyotes are direct competitors to the red fox and, where the two species try to occupy the same area, the coyote will often persist. Unlike the red fox, the grey fox prefers forested habitats. Grey fox have also been protected from harvest in the past. Both fox species can be found in Benton and Washington counties (AGFC 2001c).

Often considered a nuisance species, raccoon populations are currently high throughout Arkansas and the ROI. Raccoons are the number one harvested species during furbearing season, and have been for the past

50 years (AGFC 2001c). At one point, when population numbers were very low due to over hunting and trapping to obtain high priced pelts, raccoon denning trees were protected to help the species proliferate. Raccoons are commonly live-trapped and removed from certain areas due to nuisance complaints. Populations can be high due to the species high fertility rate and easily fulfilled habitat requirements (AGFC 2001c).

Although harvest has been somewhat low in recent years, mink can be found throughout Arkansas and the ROI. They are most plentiful in the eastern portion of the State where irrigation practices provide adequate habitat (AGFC 2001c). As with other species, mink populations declined profusely in the early 1900s due to unregulated trapping and hunting. To help restore populations, the species was live-trapped from in-state game refuges and transplanted to areas where they were scarce. Compared to pelts of other species, current prices for mink pelts are high (AGFC 2001c).

The two species of skunk in Arkansas that can be harvested during furbearer season are the striped skunk and the eastern spotted skunk (AGFC 2005a). Striped skunk populations declined dramatically in the 1950s due to market hunting for pelts. As new laws were passed to stop the use of this species in garment making, populations increased. An even more remarkable decline occurred in the 1970s due to a rabies outbreak in Arkansas (AGFC 2001c). This species most often inhabits cleared pasture and agricultural lands. The spotted skunk, also known as a *civet cat*, is found throughout all but the eastern most portion of the State. Spotted skunks inhabit mountainous areas, such as the Ozark Mountain region, where they utilize rocky outcroppings and ledges for habitat. The Ozark Mountain region accounted for 72 percent of spotted skunks harvested in 2001 (AGFC 2001c).

Before AGFC listed bobcats as a furbearer species with a regulated harvest, they were considered vermin and hunted indiscriminately along with other predators, such as wolves and mountain lions. Due to high prices being paid for spotted animal pelts, there was past concern as to whether bobcat populations could sustain themselves. Although wolves no longer occur in Arkansas and mountain lions are scarce, bobcats now occur in all counties of the State and the ROI (AGFC 2001c). Bobcats are very stealthy and thus rarely seen, so AGFC requires all bobcat pelts to be tagged by a game official before leaving the State to determine populations and harvests.

Other small game includes quail, rabbit, squirrel, and feral hogs. When Arkansas was first settled, the majority of the land was forested; a habitat that is not generally used by bobwhite quail. Once land use changed to accommodate agriculture and cattle grazing, bobwhite quail habitat became abundant and the species thrived. As the population in Arkansas grew and agricultural practices changed to include the use of machinery, bobwhite quail populations declined and have continued to decline since the 1940s. Despite this decline, this species can be found in every Arkansas county and the ROI (AGFC 2001d).

The three species of rabbit in Arkansas are the cottontail, the swamp rabbit, and the jack rabbit. Only the cottontail and swamp rabbit are legal to hunt (AGFC 2001e). The cottontail rabbit commonly utilizes areas of brushy fencerows, woodland edge areas, and overgrown farmland. Populations are currently stable, although they may have declined slightly when farming was modernized by the use of machinery, and cottontails are found throughout the State and ROI (AGFC 2001e). Swamp rabbits often inhabit areas of swampland or riparian habitat. The destruction of bottomland hardwood forests and the draining of wetlands have caused populations of swamp rabbits to decline. There are populations within the ROI, but their overall occurrence in Arkansas is limited. Jack rabbits first began to appear in Arkansas in Benton and Washington counties due to the clearing of land in these areas. As more forested areas are cleared for changing land uses, the range of this species may expand beyond these counties (AGFC 2001e).

Of the three squirrel species inhabiting Arkansas, only gray squirrels and fox squirrels are legal to hunt. Squirrel became a regular part of peoples' diet during the early settlement of the State when deer, bear,

and bison populations began to decline. The gray squirrel tends to prefer areas of dense hardwood and pine forests, while the fox squirrel prefers open upland woodlots. Both species are reliant on forested areas for nesting, foraging, and cover. These species can coexist in the same area; however, one will be the dominant species when they compete for resources (AGFC 2001f). The third species, the flying squirrel, is considered a non-game species. All three squirrel species occur naturally throughout Arkansas and the ROI (AGFC 2001f).

Arkansas classifies feral hogs as any hog, such as the Russian or European wild boar, that roams freely and lives in a feral (i.e., wild) state (AGFC 2006a). Feral hogs can be taken during open hunting seasons when they are found on public land and can be taken any time on private land. AGFC has linked feral hogs to numerous problems throughout the State including habitat destruction, predation on ground nesting birds, disease transmission to livestock and pets (e.g., brucellosis and pseudorabies), and disease transmission to humans (e.g., brucellosis and trichinosis) (AGFC 2006a). Feral hogs can be found throughout the majority of the State and may occur in the ROI.

Migratory game birds that occur in Arkansas and have the potential to occur in the ROI include coots, crows, doves, ducks, gallinules (or moorhens), geese, rails, snipes, and woodcocks (Table 3.2). FWS regulates the take of migratory game birds and AGFC sets regulations specifically for Arkansas based on FWS guidelines.

Table 3.2 Common and scientific names of migratory game birds that may occur in the ROI.

Common Name	Scientific Name	Common Name	Scientific Name
Bufflehead	*Bucephala albeola*	Canvasback	*Aythya valisineria*
Coot	*Fulica atra*	Crow	*Corvus brachyrhynchos*
Dove, Eurasian collared	*Streptopelia decaocto*	Dove, mourning	*Zenaida macroura*
Duck, black	*Anas rubripes*	Duck, ring-neck	*Aythya collaris*
Duck, ruddy	*Oxyura jamaicensis*	Duck, wood	*Aix sponsa*
Gadwall	*Anas strepera*	Gallinule, purple	*Porphurula martinica*
Goldeneye, common	*Bucephala clangula*	Goose, Canada	*Branta canadensis*
Goose, Ross	*Chen rossii*	Goose, snow	*Chen caerulescens*
Goose, white-fronted	*Anser albifrons*	Mallard	*Anas platyrhynchos*
Merganser, common	*Mergus merganser*	Merganser, hooded	*Lophodytes cucullatus*
Merganser, red-breasted	*Mergus serrator*	Moorhen, common	*Gallinula chloropus*
Pintail, northern	*Anas acuta*	Quail, bobwhite	*Colinus virginianus*
Rail, sora	*Porzana carolina*	Rail, Virginia	*Rallus limicola*
Redhead	*Aythya americana*	Scaup, greater	*Aythya marila*
Shoveler, northern	*Anas clypeata*	Snipe, common	*Gallinago gallinago*
Teal, blue-winged	*Anas discors*	Teal, green-winged	*Anas crecca*
Widgeon, American	*Anas americana*	Woodcock	*Scolopax minor*
Table source: AGFC 2005a			

To hunt migratory birds in Arkansas, every hunter over the age of 16 must possess an Arkansas Waterfowl Stamp, a Federal Migratory Bird Hunting and Conservation Stamp, a Harvest Information Program (HIP) registration, and a hunting license (AGFC 2006b). The HIP registration is a form which migratory bird hunters must fill out to inform FWS what species they hunted for and how many of each species were taken. HIP is mandatory nationwide program that allows FWS and individual States to collect data on migratory game bird populations in order to make management decisions regarding these species (AGFC 2006b).

Arkansas is a major waterfowl hunting State and sells more than 70,000 ducks stamps annually (AGFC 2006c). The State is part of the Mississippi flyway which follows the Mackenzie River in Canada and continues along the Mississippi River in the U.S. Other States in the flyway include Mississippi and Louisiana. Arkansas harvests more mallards per year than the rest of the Mississippi flyway combined (AGFC 2006c).

Non-Game Species

Arkansas is home to 48 species of non-game mammals, 291 migratory non-game birds, and numerous amphibians, crayfish, insects, reptiles, mussels, and various invertebrates that are also considered non-game. Non-game mammals include species such as bats, voles, gophers, armadillos, and mice. AGFC lists 25 of these mammals as species of conservation concern within the State. Non-game migratory birds include species such as owls, hawks, and songbirds, of which AGFC lists 19 as species of conservation concern. Also included on AGFC's conservation concern list were 25 amphibians, 24 crayfish, 63 insects, 52 mussels, 14 reptiles, 34 fish, and 44 other invertebrate species (AGFC 2005c). Additional information on these species is provided under *Protected Species and Habitat*.

3.1.1.2.2 Fisheries

Waterways in the ROI include the Illinois River and its tributaries. Several of these have been impacted by high levels of pathogens, sediments, and nutrients, limiting the habitat and variance of fish species. Table 3.3 lists fish species that occur in Arkansas and may also be present in the ROI.

Table 3.3 Fish species that may occur in the ROI.

Common Name	Scientific Name	Common Name	Scientific Name
Bass, Ozark	*Ambloplites constellatus*	Bass, shadow	*Ambloplites ariommus*
Buffalo, bigmouth	*Ictiobus cyprinellus*	Buffalo, smallmouth	*Ictiobus bubalus*
Carpsucker, river	*Carpiodes carpio*	Chub, bigeye	*Hybopsis amblops*
Chub, creek	*Semotilus atromaculatus*	Chub, gravel	*Erimystax x-punctatus*
Dace, Southern redbelly	*Phoxinus erythrogaster*	Darter, banded	*Etheostoma zonale*
Darter, channel	*Percina copelandi*	Darter, fantail	*Etheostoma flabellare*
Darter, greenside	*Etheostoma blennioides*	Darter, least	*Etheostoma microperca*
Darter, orangethroat	*Etheostoma spectabile*	Darter, redfin	*Etheostoma whipplei*
Darter, river	*Percina shumardi*	Darter, slenderhead	*Percina phoxocephala*
Darter, speckled	*Etheostoma stigmaeum*	Darter, stippled	*Etheostoma punctulatum*
Drum, freshwater	*Aplodinotus grunniens*	Lamprey, chestnut	*Ichthyomyzon castaneus*
Logperch	*Percina caprodes*	Madtom, brindled	*Noturus miurus*
Madtom, freckled	*Noturus nocturnus*	Madtom, slender	*Noturus exilis*

Table 3.3 Continued

Common Name	Scientific Name	Common Name	Scientific Name
Minnow, bluntnose	*Pimephales notatus*	Minnow, bullhead	*Pimephales vigilax*
Minnow, fathead	*Pimephales promelas*	Minnow, Ozark	*Notropis nubilus*
Minnow, slim	*Pimephales tenellus*	Mosquitofish, Western	*Gambusia affinis*
Redhorse, black	*Moxostoma duquesnei*	Redhorse, golden	*Moxostoma erythrurum*
Redhorse, river	*Moxostoma carinatum*	Sculpin, banded	*Cottus carolinae*
Shad, gizzard	*Dorosoma cepedianum*	Shiner, bigeye	*Notropis boops*
Shiner, bluntface	*Cyprinella camura*	Shiner, cardinal	*Luxilus cardinalis*
Shiner, emerald	*Notropis atherinoides*	Shiner, ghost	*Notropis buchanani*
Shiner, golden	*Notemigonus crysoleucas*	Shiner, mimic	*Notropis volucellus*
Shiner, redfin	*Lythrurus umbratilis*	Shiner, ribbon	*Lythrurus fumeus*
Shiner, spotfin	*Cyprinella spiloptera*	Shiner, steelcolor	*Cyprinella whipplei*
Shiner, striped	*Luxilus chrysocephalus*	Shiner, wedgespot	*Notropis greenei*
Shiner, whitetail	*Cyprinella galactura*	Silverside, brook	*Labidesthes sicculus*
Stonecat	*Noturus flavus*	Stoneroller, central	*Campostoma anomalum*
Stoneroller, largescale	*Campostoma oligolepis*	Studfish, Northern	*Fundulus catenatus*
Sucker, Northern hog	*Hypentelium nigricans*	Sucker, spotted	*Minytrema melanops*
Sucker, white	*Catostomus commersoni*	Sunfish, longear	*Lepomis megalotis*
Sunfish, redear	*Lepomis microlophus*	Topminnow, blackspotted	*Fundulus olivaceus*
Topminnow, blackstripe	*Fundulus notatus*		

Table source: NatureServe 2004

Sport fishing is widespread in Arkansas and regulated by AGFC. Popular game fish include bass, catfish, crappie, gar, sunfish, carp, and trout (Table 3.4). Some of these species, such as cutthroat trout and lake trout, are not native to the State. Arkansas supplements its game fish population with hatchery-raised fish. There are five State-owned fish hatcheries in Arkansas, all of which may supply fish to waters within the ROI. The C.B. Craig Hatchery, William H. Donham Hatchery, Joe Hogan Hatchery, and Andrew Hulsey Hatchery are warm-water facilities that raise species such as bass, crappie, and catfish (AGFC 2006c). The Jim Hinkle Spring River Hatchery is a cold-water hatchery that raises trout. There are also three national hatcheries in Arkansas: Greers Ferry Hatchery, Mammoth Springs Hatchery, and the Norfolk Hatchery (FWS 2005a). These hatcheries raise trout, bass, paddlefish, sturgeon, walleye, and bluegill. There is one State-owned hatchery, the C.B. Craig Fish Hatchery, within the ROI and no national hatcheries (see Section 3.6, *Recreation*).

Table 3.4 Game fish in Arkansas.

Common Name	Scientific Name	Common Name	Scientific Name
Bass, largemouth	*Micropterus salmoides*	Bass, rock	*Ambloplites rupestris*
Bass, smallmouth	*Micropterus dolomieu*	Bass, spotted	*Micropterus punctulatus*
Bass, white	*Morone chrysops*	Bass, yellow	*Morone mississippiensis*
Bluegill	*Lepomis macrochirus*	Bowfin	*Amia calva*

Table 3.4 Continued

Common Name	Scientific Name	Common Name	Scientific Name
Bullhead, black	*Ameiurus melas*	Bullhead, brown	*Ictalurus nebulosus*
Bullhead, yellow	*Ameiurus natalis*	Carp, common	*Cyprinus carpio*
Carp, grass	*Ctenopharyngodon idella*	Catfish, blue	*Ictalurus furcatus*
Catfish, channel	*Ictalurus punctatus*	Catfish, flathead	*Pylodictis olivaris*
Crappie, black	*Pomoxis nigromaculatus*	Crappie, white	*Pomoxis nigromaculatus*
Gar, alligator	*Atractosteus spatula*	Gar, longnose	*Lepisosteus osseus*
Gar, shortnose	*Lepisosteus platostomus*	Gar, spotted	*Lepisosteus oculatus*
Paddlefish	*Polyodon spathula*	Pickerel, chain	*Esox niger*
Sauger	*Sander canadense*	Sunfish, green	*Lepomis cyanellus*
Sunfish, orange spotted	*Lepomis humilis*	Sunfish, spotted	*Lepomis gibbosus*
Trout, brown	*Salmo trutta*	Trout, brook	*Salvelinus fontinalis*
Trout, cutthroat	*Salmo clarki*	Trout, lake	*Salvelinus namaycush*
Trout, rainbow	*Oncorhynchus mykiss*	Walleye	*Stizostedion vitreum*
Warmouth	*Chaenobryttus gulosus*		
Table source: AGFC 2006d			

Largemouth bass virus (LMBV) has been found in many Arkansas watersheds including Beaver, Bull Shoals, Norfork, Dardanelle, Conway, Greers Ferry, Ouachita, Hamilton, Greeson, DeGray, DeQueen, Millwood, Lower White Oak, Monticello, Chicrot, Felsenthal, Columbia Lakes, and portions of the Arkansas River Watershed (AGFC 2006e). LMBV affects the swim bladder of adult bass causing the fish to have difficulty in swimming. Most fish showing symptoms of LMBV will rise to the surface of the water. Research indicates that LMBV is not always fatal among bass populations, and some fish may have the virus without showing any symptoms. LMBV can be carried by other fish species, such as bluegill and crappie, but largemouth bass are the only species in which the virus causes disease. As of yet, LMBV has not been found in the Illinois River Watershed (i.e., the ROI) (AGFC 2006e).

3.1.2 Vegetation

3.1.2.1 Description

Vegetation includes native and introduced plant species. The ROI for this resource analysis includes portions of Benton and Washington counties as described in Section 1.3.

3.1.2.2 Affected Environment

By definition, ecoregions are areas of relatively uniform ecological systems that have similar vegetation, climate, and geology.[1] Arkansas is divided into seven Level III Ecoregions, of which two occur in the ROI: the Ozark Highlands and the Boston Mountains. These Level III ecoregions are further subdivided

[1] A Roman numeral hierarchy is used to denote different levels of ecoregions (Woods et al. 2004). Level I Ecoregions are the broadest level and divide North America into 15 ecological regions. Level II Ecoregions divide North America into 52 ecological regions and Level III Ecoregions divide the continental U.S. into 104 ecological regions. Level IV Ecoregions are a further division of Level III Ecoregions. Within the hierarchy of ecoregions, each lower level is more specific in regards to vegetation, climate, and geology on a smaller scale. Level III and Level IV ecoregions are typically used to describe the ecological regions of individual States.

into Level IV Ecoregions, or for the purposes of discussion in this analysis, *subregions* (Table 3.5, Figure 3.1). The potential natural vegetation of the subregions within the ROI as described by Wood and others (2004) is discussed in the following subsections.

Table 3.5 Level III Ecoregions and subregions in the ROI.

Level III Ecoregion	Subregion	Counties
Boston Mountains	Lower Boston Mountains	Washington
Ozark Highlands	Dissected Springfield Plateau—Elk River Hills	Benton, Washington
	Springfield Plateau	Benton, Washington
Table source: Wood et al. 2004		

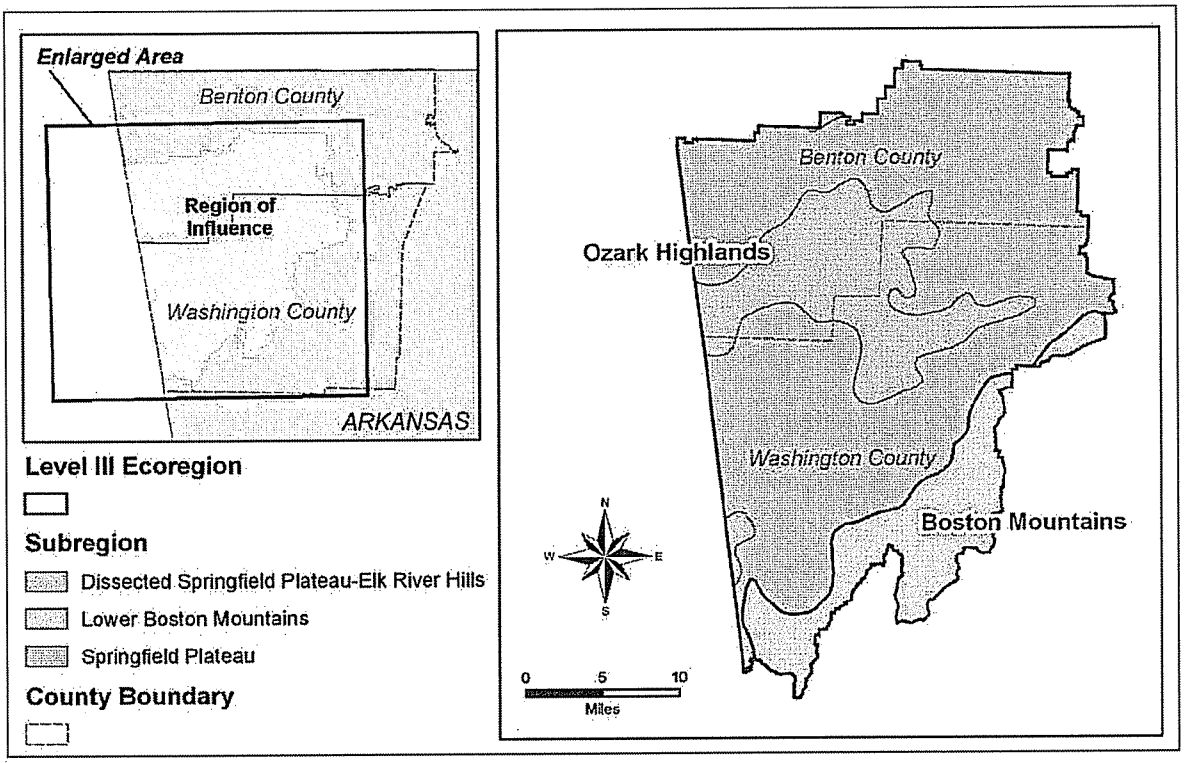

Figure 3.1 Ecoregions and subregions within the ROI.

3.1.2.2.1 Boston Mountains

The Boston Mountains Level III Ecoregion contains one subregion in the ROI, the Lower Boston Mountains. This subregion covers the southeastern border of the Washington County portion of the ROI (Figure 3.1).

Vegetation in the Lower Boston Mountains includes oak-hickory-pine forests, oak-hickory forests, mixed oak forests, and oak-pine forests. Woodland and savanna areas can be found in the uplands. Vegetation species include northern red oak, white oak, post oak, scarlet oak, black oak, blackjack oak, pignut hickory, shagbark hickory, mockernut hickory, and shortleaf pine. Sweetgum, willows, birch, American

sycamore, and hickory and oak species may occur in areas of floodplains and low terraces. Lands within this subregion are used for pasture or hay crops, logging, and recreation.

3.1.2.2.2 Ozark Highlands

Within the ROI, the Ozark Highlands Level III Ecoregion contains the Dissected Springfield Plateau—Elk River Hills and Springfield Plateau subregions. The Dissected Springfield Plateau—Elk River Hills subregion covers three separate portions within Benton and Washington counties (Figure 3.1). This subregion is characterized by oak-hickory pine forests, oak-hickory forests, mixed deciduous upland forests, and mixed deciduous-pine forests. Species present may include black oak, white oak, blackjack oak, post oak, beech, sugar maple, and various hickories. Land uses within the Dissected Springfield Plateau—Elk River Hills subregion includes woodland grazing, logging, recreation, quarrying, livestock farming, and housing developments.

The Springfield Plateau is the dominant subregion in the ROI, covering large portions of Benton and Washington counties. Vegetation in this subregion is similar to that of the Dissected Springfield Plateau—Elk Rivers Hills and includes oak-hickory and oak-hickory-pine forests. Before the 19th century, the Springfield Plateau contained savannas and tallgrass prairie, which were regularly burned due to natural fire regimes. Upland areas now consist of mixed deciduous forests and mixed deciduous-shortleaf pine forests. Vegetation includes such species as black oak, white oak, blackjack oak, post oak, various hickories, willows, maples, birch, American elm, and American sycamore. Land in this subregion is used for pasture, hay crops, residential development, some grain production, fruit orchards, grape crops, and vegetable crops. Farming in this area is primarily poultry, cattle, and hogs.

3.1.3 Protected Species and Habitat

3.1.3.1 Description

Protected species are those terrestrial, avian, and aquatic species designated by FWS as threatened, endangered, or candidate species under the *Endangered Species Act* (16 USC parts 1531 et seq., 1988). Arkansas does not have State legislation for endangered species; however, both Arkansas Natural Heritage Commission (ANHC) and AGFC track species they consider to be of special concern in the State. The ROI for this resource analysis is Benton and Washington counties.

Critical habitats are specific geographic areas that are essential for conservation of a particular species and that have been formally designated by Federal rule. There is no critical habitat located within the ROI.

3.1.3.2 Affected Environment

For the State of Arkansas, FWS lists 25 animals and 6 plants as threatened or endangered, and 5 plant and animal species as candidates for listing. The Federal and State status for each of these protected species is provided in Table 3.6.

Table 3.6 Protected species in Arkansas.

Species	State Status[1]	Federal Status[2]	Species	State Status[1]	Federal Status[2]
Bat, gray (*Myotis grisescens*)	S2	E	Bat, Indiana (*Myotis odalist*)	S1	E
Bat, Ozark big-eared (*Corynorhinus townsendii ingens*)	S1	E	Beetle, American burying (*Nicrophorus americanus*)	S1	E
Bladderpod, Missouri (*Lesquerella filiformis*)	S1	T	Cavefish, Ozark (*Amblyopsis rosae*)	S1	T

Table 3.6 Continued

Species	State Status[1]	Federal Status[2]	Species	State Status[1]	Federal Status[2]
Clover, running buffalo (*Trifolium stoloniferum*)	SH	E	Crayfish, cave (*Cambarus aculabrum*)	S1	E
Crayfish, cave (*Cambarus zophonastes*)	S1	E	Curlew, Eskimo (*Numenius borealis*)	---	E
Darter, Arkansas (*Etheostoma cragini*)	S1	C	Darter, leopard (*Percina pantherina*)	S1	T
Darter, yellowcheek (*Etheostoma moorei*)	S1	C	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)	S2B, SN4	T
Fatmucket, Arkansas (*Lampsilis powelli*)	S2	T	Harperella (*Ptilimnium nodosum*)	S2	E
Hellbender, Ozark (*Cryptobranchus alleganiensis bishopi*)	S2	C	*Geocarpon minimum* (no common name)	S2	T
Mucket, Neosho (*Lampsilis rafinesqueana*)	S1	C	Mucket, pink (pearlymussel) (*Lampsilis abrupta*)	S2	E
Mussel, scaleshell (*Leptodea leptodon*)	S1	E	Orchid, Eastern prairie fringed (*Platanthera leucophaea*)	---	T
Panther, Florida (*Puma concolor coryi*)	---	E	Pearlymussel, Curtis (*Epioblasma florentina curtisii*)	S1	E
Pocketbook, fat (*Potamilus capax*)	S1	E	Pocketbook, Ouachita rock (*Arkansia wheeleri*)	S1	E
Pocketbook, speckled (*Lampsilis streckeri*)	S1	E	Pondberry (*Lindera melissifolia*)	S2	E
Shagreen, Magazine Mountain (*Mesodon magazinensis*)	S1	T	Shiner, Arkansas River (Arkansas River Basin) (*Notropis girardi*)	SX	T
Spectaclecase (*Cumberlandia monodonta*)	S1	C	Sturgeon, pallid (*Scaphirhynchus albus*)	S1	E
Tern, least (interior population) (*Sterna antillarum*)	S2B	E	Wolf, gray (lower 48 States, except MN and where XN; and Mexico) (Canis lupus)	---	E
Woodpecker, ivory-billed (*Campephilus principalis*)	---	E	Woodpecker, red-cockaded (*Picoides borealis*)	S2	E

[1]State status codes: B=breeding; N=nesting; SH=historical occurrence in the State, but not verified within the last 15 years; SX=apparently extirpated from the State; S1=extremely rare and vulnerable to extirpation; S2=very rare and susceptible to extirpation; S4=common, not susceptible to immediate threat

[2]Federal status codes: C=candidate; E=endangered; T=threatened

Table sources: ANHC 2005a, b; FWS 2006a

There are ten of these protected species that may or have historically inhabited the ROI. This includes four mammals, one plant, two fish, one bird, one crayfish, and one mussel (Table 3.7). Although candidate species are not afforded the same protection as threatened and endangered species, they will be considered as protected species for the purposes of this analysis.

Table 3.7 Protected species in the ROI.

Species	County Where Species Occurs	State Status [1]	Federal Status [2]
Bat, gray	Benton, Washington	S2	E
Bat, Indiana	Benton, Washington	S1	E

Species	County Where Species Occurs	State Status [1]	Federal Status [2]
Bat, Ozark big-eared	Washington	S1	E
Bladderpod, Missouri	Washington	S1	E
Cavefish, Ozark	Benton	S1	E
Crayfish, cave	Benton	S1	E
Darter, Arkansas	Benton	S1	C
Eagle, bald	Benton, Washington	S2B, SN4	T
Mucket, Neosho	Benton	S1	C
Panther, Florida	Washington	---	E

[1]State status codes: B=breeding; N=nesting; S1=extremely rare and vulnerable to extirpation; S2=very rare and susceptible to extirpation; S4=common, not susceptible to immediate threat

[2]Federal status codes: C = candidate; E = endangered; T = threatened

Table source: FWS 2007a, MNHP 2006

Gray Bat

The gray bat is a karst-dependant species. Karst topography is formed when water erodes carbonate rocks (e.g., limestone), forming underground streams, sinkholes, and caves. Gray bats live year round in the caves created by this process. Most populations occur in the northern counties of Arkansas, including Benton and Washington counties (ANHC 2006a).

In winter months, gray bats hibernate in deep vertical caves that trap cold air. Gray bats will occupy these areas in clusters, often numbering up to several thousand individuals. In the summer, maternity colonies of gray bats will form in karst caves that contain streams. These caves will have domed ceilings or separate rooms that trap the warm air created by body heat from the clusters of bats. Gray bats rely heavily on riparian areas for foraging, mostly feeding on mayflies and other insects (ANHC 2006a).

Because their habitat requirements are very specific, loss or disruption of habitat is the most critical factor limiting this species across its range. Specifically, the disturbance of maternity colony habitat during the summer months can cause thousands of young bats to be abandoned or dropped to the cave floor. Other factors restricting gray bat populations are pesticide poisoning, stream impoundments and the flooding or collapse of cave habitats (ANHC 2006a).

Indiana Bat

Indiana bats primarily roost in caves which are selected by the dimensions of the cave. In winter, the Indiana bat chooses caves that will provide stable, cold temperatures in order to allow them to retain fat supplies and expend less energy (FWS 1983). There is less known about summer requirements; however, maternity habitat seems focused around riparian areas and floodplains of smaller waterbodies. Riparian areas with mature trees that overhang waterways provide suitable foraging habitat, as Indiana bats appear to forage more on aquatic insects then terrestrial ones (FWS 1983).

Ozark Big-Eared Bat

The requirements of the Ozark big-eared bat are very similar to that of gray bats. This species is also karst-dependant. Colonies of Ozark big-eared bats hibernate in deep vertical caves in the winter and use domed ceiling caves or caves with separate rooms for maternity colonies. Moths are the primary diet of this bat and most foraging takes place along forest edges (ANHC 2006b).

This species used to occupy most of the Ozark Mountain region of Oklahoma, Arkansas, and Missouri, but is now only found in Oklahoma and Arkansas. Within the State of Arkansas, Ozark big-eared bats inhabit areas of suitable habitat in Marion and Washington counties (ANHC 2006b).

The Ozark big-eared bats face the same limiting factors as the gray bat; mainly loss and degradation of habitat. Disturbances at hibernating sites cause the bats to use stored fat reserves which may lead to individual mortalities. Disturbances at maternity colony sites often cause direct mortality to young bats (ANHC 2006b).

Missouri Bladderpod

The Missouri bladderpod is a small annual plant that can be found in four counties of northern Arkansas, including Washington County. Missouri bladderpods populate glade areas, which are naturally dry regions of shallow and loose soil that are often treeless and have exposed rock. Glade habitats are typically found along highways and in pastures that are frequently mowed or grazed (FWS 2003).

Factors inhibiting the spread of Missouri bladderpods include habitat loss, fire suppression, and roadside maintenance. Habitat loss is due to residential development, the introduction of woody and non-native grasses to suitable habitat areas, and overgrazing. Fire suppression reduces Missouri bladderpod habitat is reduced because this species needs open glade areas and cannot compete with other grasses. Roadside maintenance activities, such as spraying for weeds, also negatively affect this species (FWS 2003).

Ozark Cavefish

The Ozark cavefish is a small colorless fish that is karst-dependant. Within Arkansas, this species is only found in Benton County. Ozark Cavefish occupy cave streams and springs with gravel bottoms. It may also use pools with silt and sand bottoms, but less frequently. Because the streams in which Ozark cavefish live are usually fed from underground, nutrient input to these streams is normally from gray bat guano and leaf litter. Therefore, prime Ozark cavefish habitat is within streams in caves occupied by gray bats, which are also an endangered species (ANHC 2006c).

This species is dependant on good water quality, and can be negatively affected by runoff contaminants such as pesticides and animal waste. Lower water tables have also contributed to the decline of this species (ANHC 2006c).

Cave Crayfish

Cambarus aculabrum is a cave crayfish specially adapted to living in stable cave environments that include low light and temperature. This species is known to occur in Benton County; located in Logan Cave, which is federally owned, and Bear Hollow Cave, which is privately owned (FWS 1993a).

Cave crayfish require stable environments that include low light and low temperatures. They are unable to tolerate rapid changes in habitat. Water quality degradation is the number one limiting factor to cave crayfish populations (FWS 1993a).

Arkansas Darter

Arkansas darter populations can be found in the Illinois River Watershed in smaller springs that run mostly through private lands in Benton County. Their habitat requirements include sandy or pebbled pool bottoms in small, spring-fed streams that contain cool water and some aquatic vegetation (FWS 2005b).

The depletion of spring-fed streams and marshes due to agricultural needs has forced the Arkansas darter to inhabit less favorable habits in which it is a poor competitor. This species does not thrive in habitats that contain a diversity of fish species (FWS 2005b).

Bald Eagle

Arkansas ranks in the top ten States in which wintering bald eagles can be observed, numbering 1,000 eagles annually. This species is found in both Benton and Washington counties (AGFC 2006f).

Bald eagles are a riparian-dependant species. They are frequently found in or near riparian areas where they forage on waterfowl and fish. Some eagles will inhabit terrestrial environments and feed on carrion or small game. Nesting bald eagles are predominantly associated with lakes, rivers, or coastal areas. Breeding areas are located on large trees and cliffs and, rarely, on the ground (AGFC 2006f).

Bald eagles are very vulnerable to the effects of habitat loss. Increased development and the modification or destruction of wild lands has had a cumulative negative effect to this species. Human disturbance also affects this species and has been documented as the reason for some reproductive failure in breeding areas. Historically, the decline of the bald eagle was linked to dichloro-diphenyl-trichloroethane (DDT), a commonly used pesticide prior to 1972. The presence of DDT caused eggshells to be very thin, which caused the eggs to break when females began to incubate them. This resulted in a significant and rapid decline in bald eagle populations (AGFC 2006f).

Neosho Mucket

The Neosho mucket is a large mussel that burrows in the gravel substrate of stream riffles and runs. The current within these waterways will be moderately swift and the substrate loose. Reduction of habitat due to impoundments, sedimentation, and pollutants, is adversely affecting this species. Neosho muckets will not inhabit areas of impounded water. Impounding waterways once suitable for this species also causes fragmentation of Neosho mucket habitat. Excessive sedimentation levels adversely affect all mussel species due to suffocation and a reduction in juvenile recruitment. Mining, cattle grazing, construction activities, and agriculture have increased sedimentation entering waterways within the habitat of the Neosho mucket. Pesticides, heavy metals, and excessive nutrients may also adversely affect Neosho muckets (FWS 2004).

Florida Panther

The Florida panther is one of North America's most endangered mammals. Though the historical range of the Florida panther once included portions of Arkansas; including Washington County, there are currently no panthers located within the State. The last remaining population of Florida panthers occurs in south Florida (FWS 1993).

3.2 Cultural Resources

3.2.1 Archaeological Resources

3.2.1.1 Description

Archaeological resources are locations and objects from past human activities. The ROI for this resource analysis is Benton and Washington counties.

3.2.1.2 Affected Environment

American Indians were the earliest inhabitants of Arkansas. They were joined in the late 17th century by the French and, in the 18th and 19th centuries, by Anglo-Americans who migrated west from the states east of the Mississippi River. The rich cultural history of Arkansas, also called the *Land of Opportunity*, represents over 12,000 years of human land use and is illustrated by the thousands of cultural resources found throughout the State. As of 2006, over 53,000 cultural resources had been identified across Arkansas including more than 23,000 properties recorded by the Arkansas Historic Preservation Program (AHPP) and over 30,000 prehistoric and historic archaeological sites listed in the Arkansas

Archaeological Survey database (AHPP 2002, 2006). Arkansas has 2,265 properties listed on the National Register of Historic Places (NRHP), with 279 of them located within Benton and Washington counties. There are presently three archaeological sites listed on the NRHP which occur within or near the ROI (Table 3.8) (NRHP 2006).

Table 3.8 Archaeological sites within the ROI.

Site	County	Cultural Affiliation
Goforth-Saindon Mound Group	Benton	Prehistoric
Bluff Point	Washington	Prehistoric
Brown Bluff	Washington	Prehistoric/Mississippi Period
Table source: NRHP 2006		

3.2.1.2.1 Prehistoric Periods (12,000 B.C.–1540 A.D.)

Studies in paleoecology, ethnography, history, and archaeology have resulted in a better understanding of more than 12,000 years of human land use and culture in Arkansas. Archaeologists organize this information chronologically based diagnostic artifacts or artifact assemblages from the archaeological record and the environmental conditions that affected human adaptation to the landscape. The following are brief summaries of the time periods related to cultures of what is now the State of Arkansas.

Paleoindian Period (12,000–8,000 B.C.)

This period is characterized by a nomadic human population settlement pattern and small bands who hunted game such as mastodons, giant sloths, Pleistocene bison, deer, rabbits, and turtles for subsistence. It is believed that Arkansas was very sparsely populated during this time period. Clovis points, then used for hunting, have not been discovered in Arkansas sites.

Dalton Period (8,000–7,000 B.C.)

The Dalton Period marked a transition between the game hunting of the Paleoindian cultures and the hunting-foraging of the Archaic period. Climate shifts resulted in changes to plant and animal communities and new diet and hunting strategies using a variety of plant and animal foods. The existence of tools such as mortars, manos, grinding slabs, cupstones, and hammerstones indicate plant food processing. The Dalton serrated point with beveled edges is an important technological marker of this period. Studies indicate they may have been used as knives to butcher deer. Dalton points have been discovered across Arkansas at hundreds of sites. Another distinctive woodworking tool, called a Dalton adze, also characterizes this period.

Archaic Period (7,000–500 B.C.)

A long period of dry and warm climate, known as the *hypsithermal*, began in the Archaic Period. Grasslands expanded and deciduous forests shrank. This period marked new reliance on hunting-foraging traditions and dry-climate floral and faunal species for subsistence. One important innovation that occurred during this period in Arkansas was gardening. Mound building was another advance that began in the uplands west of the Mississippi River. Mounds may have been political and ritual activity centers. Archaic technology was similar to that of the earlier Dalton period. It included chipped stone tools and stone-tipped spears that were hurled by atlatls. Stone tools were made by grinding as well as chipping. Although still thinly scattered across the landscape, thousands of Archaic sites have been identified in Arkansas; however, no large mounds have been recorded in the State from this time period.

Woodland Period (500 B.C.–900 A.D.)

Pottery first appeared in Arkansas during the Woodland Period. The appearance of pottery illustrates a change in diet to include seeds, nuts, and other plants that were processed into soups, stews, and mush, and also the beginning of a less mobile lifestyle. Spears, nets, traps, and possibly bolas were used to hunt animals with bows and arrows that appeared about 1,400 years ago. Associated technologies in the forms of plummets and boatstones also appeared. Corn or maize was grown for the first time in this area in the Ozark Highlands and central Arkansas River Valley about 1,200 to 1,400 years ago. Although Woodland people did not live in permanent villages, sturdy structures and middens containing items such as stone tools, waste materials, and human and animal burials have been found. Mound building occurred in Arkansas and regional differences in cultural practices and technology began to take place.

Mississippian Period (900 A.D.–1540 A.D.)

Fundamental cultural changes took place during the Mississippian Period. People subsisted primarily on garden crops and society became hierarchal with some individuals and families having more power and wealth than others. Status symbols included costumes and ritual items of shell, pottery, and other materials. Clay figurines of humans, animals, and supernatural creatures were created for special ceremonies. Mississippian technologies included the bow and arrow, stone hoes used for farming, and, perhaps, blowguns.

A regional version of Mississippian culture arose in what are now Louisiana, Texas, Oklahoma, and southwestern Arkansas. Known as the Caddo culture, settlements were mostly small farmsteads with centralized religious and political mound centers. Pottery was covered with complicated geometric patterns and baskets, mats, and other items were woven from reeds, grasses, and cane. Around 1500 A.D. changes in settlement patterns and cultural practices occurred as a consequence of previously unknown diseases that may have resulted from indirect contact between native peoples and Europeans.

3.2.1.2.2 Protohistoric and Historic Periods (1541 A.D.–Present)

The protohistoric period in what is now considered Arkansas was marked by European contact with American Indians. With this contact, weighty changes occurred to the American Indian culture. Spanish horses were introduced and became a major part of the culture, along with formerly unknown disease. Hernando de Soto and his men were the first Europeans to enter Arkansas on June 18, 1541. They were followed by a French expedition in the summer of 1673 led by Jesuit missionary, Father Jacques Marquette, and trader, Louis Joliet. Larger expeditions followed and established missions and trading posts, including the Arkansas Post established by Henri De Tonti. In 1762, the entire Louisiana Territory, including the Arkansas area, was ceded to Spain. A few farming families of French, Anglo-Americans, and German Protestants began arriving in the latter part of the 18th century. By the end of the century American Indian and black slaves, as well as free blacks and mulattoes, worked for Arkansas farmers and as domestics.

In May of 1803, the Louisiana Purchase was signed between France and the U.S. On March 23, 1804, Arkansas became a part of the U.S. and the displacement of American Indians by European settlers began in earnest. Beginning after the 1830 *Indian Removal Act*, American Indians were driven from the southeast and traveled through Arkansas to Oklahoma on what is now known as the *Trail of Tears*. Comprised of a system of trails rather than a single route, all passed through Arkansas.

In 1836, Arkansas became the 25th State. By the 1850s, most Arkansans were engaged in farming and a slave-based plantation based culture had developed. With cotton as the primary crop, unheralded prosperity occurred in the late 1850s. The Civil War ended this prosperity. Arkansas, a predominantly Confederate State, seceded from the U.S. on May 6, 1861; however, strong Union support existed in the